



Insect Control



Protects Utah's Agriculture

Summary of Insect Damage Facts

Insect	Damage
African Honey Bee	Potential to disrupt and reduce Utah's \$1.3 million honey industry, and cause health risks to humans and livestock
Apple maggot/ Cherry Fruit Fly	Potential to devastate Utah's \$27.5 million fruit industry.
Cereal Leaf Beetle	Potential to significantly reduce Utah's \$315 million small grain crop industry.
European Corn Borer	Potential to devastate Utah's \$35 million corn harvest.
Grasshopper/ Mormon Cricket	Potential to significantly reduce Utah's \$315 million forage crop industry.
Gypsy Moth	Potential to destroy Utah's watersheds, forests, and residential landscapes.
Japanese Beetle	Potential to significantly damage Utah's \$25 million nursery and floriculture industry.
Plum Curculio	Potential to devastate Utah's \$27.5 million fruit industry.
Red Imported Fire Ant	Economic damage caused in the United States exceeds \$5 billion dollars.

2003 Insect Report



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The Division of Plant Industry

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Introduction

In the absence of pest management, harmful insects could seriously cripple Utah's billion dollar a year agricultural industry. The future of Utah's food production environment depends upon effective control of damaging insects by producers and governmental agencies.

The Emergency Insect Program began in 1985 with the enactment of the Insect Infestation Emergency Control Act (Chapter 35, Utah Code). The following information highlights the major insect programs conducted by the Utah Department of Agriculture and Food, Division of Plant Industry.

The Utah Department of Agriculture and Food, Division of Plant Industry is helping producers in the state to control harmful insects and other agricultural and public nuisance pests by: (1) establishing insectories to rear natural predators for distribution; (2) trapping and monitoring insect movement, and (3) supporting research for better control methods that can be used in pest management programs.

We hope that you will find this publication to be informative and useful with regards to the insects that threaten the quality and viability of Utah's agricultural economy and environment.

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AFRICAN HONEY BEE

Introduction

- The African honey bee (*Aphis mellifera scutellata*) was unfortunately released in Brazil in 1956. Since then, it has migrated steadily northward, towards the United States.
- Since it was first discovered in the U.S. in 1990, the African honey bee has migrated into Arizona, Nevada, New Mexico, Texas and Southern California. Based upon experiences in Mexico and Texas, the northward migration of the African honey bee cannot be stopped.
- The African honey bee is a serious threat to the beekeeping industry because its aggressive behavior will displace domestic honey bees and compete for resources. Utah's beekeeping industry produced \$568,000 worth of honey in 2002.
- The African honey bee will always represent a public health threat because it tends to sting more readily and in greater numbers than does the domestic honey bee.



Utah's African Honey Bee Program

- Rather than imposing additional regulations, the Utah Department of Agriculture and Food along with Utah's beekeeping industry will approach the problem with surveys with early detection, management, and education of beekeepers and others involved with the program.
- The department has put into action a survey and detection program in the southern portion of the state consisting of 125 detection traps. There were no confirmed detections of African honey bees in Utah during 2003 from the survey.

Action Plan for 2004

- The African honey bee is a serious threat to Utah's beekeeping industry, and is also a public health threat. In 2004 UDAF plans to continue detection trapping of the African honey bee to determine if it has migrated into the state. UDAF will also continue to conduct education and outreach on issues concerning the African honey bee to the public and the beekeeping community.

APPLE MAGGOT AND CHERRY FRUIT FLY

Introduction

- The apple maggot (*Rhagoletis pomonella*), also known as the “railroad- worm”, is a picture-wing fly native to North America. The cherry fruit fly (*Rhagoletis indifferens*), is also native to North America. It is blackish in color with tinges of yellow on the head and lateral margins of the thorax. Both insects have become a major pest of fruit trees in the U.S. and Canada.



- Fruit marketed for export must be free from all apple maggot and cherry fruit fly injury. Therefore, thorough and effective control measures are necessary. There are more than 300 commercial fruit growers in Utah, with a commercial value of more than 27 million dollars annually. With Utah’s apple maggot and cherry fruit fly program in place, fruit growers in Utah are able to export fruit to states that have quarantines, against these pests. *All western states have apple maggot and cherry fruit fly quarantines.*

Utah’s Apple Maggot and Cherry Fruit Fly Program

- The Apple Maggot Program began in 1985 with the discovery of the apple maggot fly in Utah County; it has been subsequently amended to include cherry fruit fly detection and control. The program provides commercial growers with information that helps with better timing for insecticide spraying. Accurately timed sprays result in fewer insecticides being used with less harm to the environment and lower production costs. Without proper control, these insects could cause serious damage to all tree fruit grown in the state.
- Apple maggot catches have decreased from over 60 in 1994 to less than 10 in 2002 and 0 in 2003. UDAF employees monitor approximately 600 insect traps during the growing season. *No apple maggots have been found in commercial orchards. All apple maggot catches have been in abandoned or non-commercial orchards.*

Action Plan for 2004

- UDAF plans to continue its detection trapping program in 2004, providing commercial fruit growers with vital information to prevent apple maggots and cherry fruit flies from spreading and affecting the quality and marketability of Utah’s commercially grown fruit.

CEREAL LEAF BEETLE

Introduction

- The cereal leaf beetle (*Ouleama melanoplus*) is a small, metallic blue and red beetle. It originated in Europe, and was first identified in the U.S. in 1962.
- Both the larva and adult feed on the leaves of small grains, such as barley and oats. The cereal leaf beetle has the potential to seriously damage crops, reducing harvests by 75%. For this reason, domestic grain markets require fumigation of grain or guaranteed insect free shipments to prevent the spread of the cereal leaf beetle. *Many western states have a quarantine in place for the cereal leaf beetle, including Arizona, California, and Nevada.*
- This insect has established populations in the western states, of Colorado, Idaho, Montana, Utah, and Wyoming.
- Small grains and field crops represent Utah's greatest agricultural strength, with a 2003 total production value over 300 million dollars.



Utah's Cereal Leaf Beetle Program


- The cereal leaf beetle was first identified in Utah in 1984. Now 17 of Utah's agricultural counties, including the nine northernmost counties, have cereal leaf beetle.
- The Utah Department of Agriculture and Food conducts an annual survey in cooperation with Utah State University to determine the range and density of the cereal leaf beetle population.
- A cooperative insectory program to produce natural predators of the cereal leaf beetle has been undertaken by UDAF, APHIS, and USU. Investigations into the effects of biological controls of cereal leaf beetles are underway in Cache, and Davis counties. Initial results indicate that biological control has the potential to reduce the cereal leaf beetle population by 75%.

Action Plan for 2004

- The cereal leaf beetle presents a serious threat to Utah's agricultural industry. UDAF will continue its program of survey trapping of this quarantined insect. UDAF will also continue to provide funding and expertise to the cooperative insectory program to produce biological controls of the beetle. Phytosanitary certification is necessary to continue export of hay and grain to other states and countries.

EUROPEAN CORN BORER

Introduction

- The European corn borer (*Ostrina nubilalis*) has become a serious threat to corn producers across most of the Eastern U.S. and Southern Canada.
 - The larva eventually becomes a moth, but it is the larval stage of the insect that damages corn and other economic crops. Sweet corn is the preferred host, but grain and silage corn can also be damaged. Over 200 other plants including cotton, sweet and hot peppers, beans, potatoes, tomatoes, oats, sugar beets and large-stemmed flowers can be damaged by this insect.
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- Utah has a quarantine (R68-10) in place for products that could harbor the European corn borer in order to keep this damaging insect from entering the state.
 - A state trapping program is annually conducted in major corn producing areas for this serious pest. In 2003, survey traps were placed in seven counties, with no detections of European corn borer.

Action Plan for 2004

- UDAF will continue its trapping program to survey for the occurrence of European corn borer in the state. Detection information is vital to agricultural producers so that they may protect their crops from this devastating insect. Approximately 100 survey traps will be placed in the corn producing areas of the state.

GRASSHOPPERS AND MORMON CRICKETS

Introduction

- Mormon crickets and grasshoppers are significant economic pests in agricultural and range lands. These insects can damage crops and bother livestock.

Utah's Mormon Cricket Grasshopper Program

- The Utah Department of Agriculture and Food in cooperation with other state and federal agencies, such as BLM and USDA APHIS, formed a decision and action committee to thoroughly investigate various methods to control major infestations of grasshoppers and Mormon crickets throughout the state.
- In the 2003 survey, the cooperative program identified over 2.7 million acres of lands infested with Mormon crickets in seven counties. Indications are that Mormon cricket infestations may be increasing statewide in 2004.
- In the 2002 survey, the cooperative program identified over 700,000 acres infested with grasshoppers in twenty-four counties (see map on page 12).



Action Plan for 2004

- Mormon cricket and grasshopper infestations constitute a serious threat to Utah's agricultural and livestock industries. In 2004 UDAF plans to continue its cooperative program of identifying and suppressing large populations of grasshoppers and Mormon crickets. Limited state, local, and private funds for suppression activities may be inadequate to control increasing populations in 2004. Federal participation in treatment and survey will be a vital asset for range and agricultural land protection. Additional state emergency funds may be needed to identify and suppress these voracious insects.

SUMMARY OF RANGELAND GRASSHOPPER AND MORMON CRICKET POPULATIONS FOR YEARS 2000-2003

GRASSHOPPER

2000

In the year 2000 statewide grasshopper infestations were at a four-year high with 593,153 acres infested. The geographic epicenter occurring in a four county area comprised of Juab, Millard, Sanpete, and Sevier Counties. Acreage totals for this infestation were 301,000 acres. For the second year in a row Sanpete county residents were the hardest hit with approximately 150,000 acres infested in the year 2000. With an increase of approximately 100,000 grasshopper infested acres statewide from the previous year. Utah growers and ranchers suffered significant crop damage, and losses due to ruined forage grasses on rangeland.

2001

Surveys in 2001 estimated grasshopper infested acreage at over 1.3 million acres for the State of Utah. Farms and rangeland in Millard County were hardest hit with infestations, 216,800 acres were estimated with 8+ grasshoppers per square yard. Sanpete County ranked second in the State for acres infested with 183,500. This is fourth year in which grasshoppers have devastated these and other Utah counties. The Central and Western part of the State, was the geographic center for 2001 grasshopper infestations. Other infestations occurred throughout the State and have significantly impacted the agricultural production and quality of life in many rural areas.

2002

Fall surveys indicate that 863,900 acres were infested with grasshoppers in the year 2002. All but four Counties in the State of Utah declined in infested acreage from 2001. Sanpete County has a significant grasshopper problem. Infested acreage in Sanpete County increased to 268,400 acres from 183,500 acres from the previous year. Tooele County increased from 74,600 acres in 2001 to 161,800 acres in 2002. Piute County has increased from 18,200 acres in 2001 to 32,600 acres in 2002. Sevier County increased from 31,000 acres in 2001 to 70,500 acres in 2002. This year the geographic center of high large-scale grasshopper populations is in Central Utah. Many small-scale infestations throughout the State continue to sustain significant agricultural damage and pose a threat for next year.

2003

The 2003 adult grasshopper acreage estimate is 725,950 acres for the State of Utah. This represents a decrease from 2002 due in part to extensive range land grasshopper treatment programs in 2002 by state and federal agencies. High density grasshopper populations plagued several crop producing areas throughout the State in 2003. Damaging infestations in prime agricultural areas such as the Bear River Valley in Rich County produced an increased need for state assisted cost share for grasshopper treatment programs. The following counties sustained a substantial increase in grasshopper infested acres and deployed area wide aerial treatment programs to combat the destructive effects of this insect; Duchesne, Daggett, Kane, Piute, Rich, Summit, Wasatch, and Wayne, Counties.

MORMON CRICKET

2000

Mormon cricket populations infested 657,348 acres of private and public land. The infestation continued south affecting the town of Knosh, Millard County. The infestation now covered an area 1,027 sq. miles in size. The counties affected were Tooele, Juab, Millard, and Beaver.

2001

Mormon cricket infestations were estimated at over 1.8 million acres for the State of Utah. Utah counties were significantly effected with the infestations occurring on a vast agricultural region. The major geographic center was the Central West area. Other outbreaks occurred in the East and North Central part of the State. Residential communities were impacted with an infestation that threatens water supplies and drastically deteriorated quality of life. This infestation is unprecedented in recent times and marks a high point in the damage caused by this devastating insect.

2002

In the year 2002 Mormon cricket populations soared reaching a staggering 2.4 million acres infested. In Millard, Juab, Tooele Counties Mormon crickets infested roughly 1.8 million acres of crop and range land. In Beaver, Sevier, Utah and Box Elder Counties the infested acreage increased significantly. The Mormon cricket problem in Utah continues to grow for the sixth year in a row. In addition to increased impact on agriculture this infestation edges closer to many rural towns and urban areas.

2003

Mormon cricket populations in 2003 increased to 2.7 million acres primarily affecting Beaver, Millard, Juab, and Tooele counties. This unprecedented infestation threatens many agricultural areas and several small municipalities. Area wide aerial treatment programs and ground baiting in 2002 suppressed localized populations, but the infestation continued to increase in 2003. New Mormon cricket populations have been documented and will threaten agricultural producers in Box Elder and Uintah counties in 2004.

SUMMARY

The total amount of grasshopper and Mormon cricket infested areas for the state of Utah in the year 2003 is 3.4 million acres. The geographic region impacted by grasshoppers in the year 2003 decreased by roughly one hundred thousand acres. State assisted area wide aerial treatment programs were conducted in Duchesne, Daggett, Kane, Piute, Rich, Summit, Wasatch, and Wayne, Counties. The large-scale grasshopper infestation that plagued Central Utah and other dry rangeland areas subsided due to extensive aerial treatment in 2001 & 2002. In 2003 many other geographically small high density grasshopper infestations occurred throughout the state that poses a risk for next year. The Mormon cricket infestation increased 300,000 acres in 2003 causing considerable damage to crops and forage in the central western part of the state. This infestation is now impacting 2.7 million acres in Utah; projections look like it will grow again next year. This disturbing trend has left many ranches and farms with heavy crop losses. The defoliation of crops and native plants has left vast areas of Utah's wild and agricultural community's devastated. The effect goes far beyond economic impact and has robbed native wildlife of winter food resources. Overall effects of grasshopper and Mormon cricket populations for the years stated above in Utah were increased economic stress on Utah's agricultural community. The negative effects of a consecutive five-year infestation of grasshopper and Mormon cricket population were coupled with severe drought conditions in the same geographic areas. An ongoing program by the State of Utah Department of Agriculture, Plant Industry, to cost share with private and public entities, will help control the spread of infestations and offset the costs to ranchers and growers who elect to minimize crop damage by utilizing control options. USDA, APHIS has been funded by Congress to control these damaging pests on public land that is infested. Continuing efforts by Utah State Department of Agriculture, Plant Industry, and USDA, APHIS, will monitor and detect grasshopper and Mormon cricket populations on public, and private lands.

USDA APHIS PPQ

UDAF Plant Industry

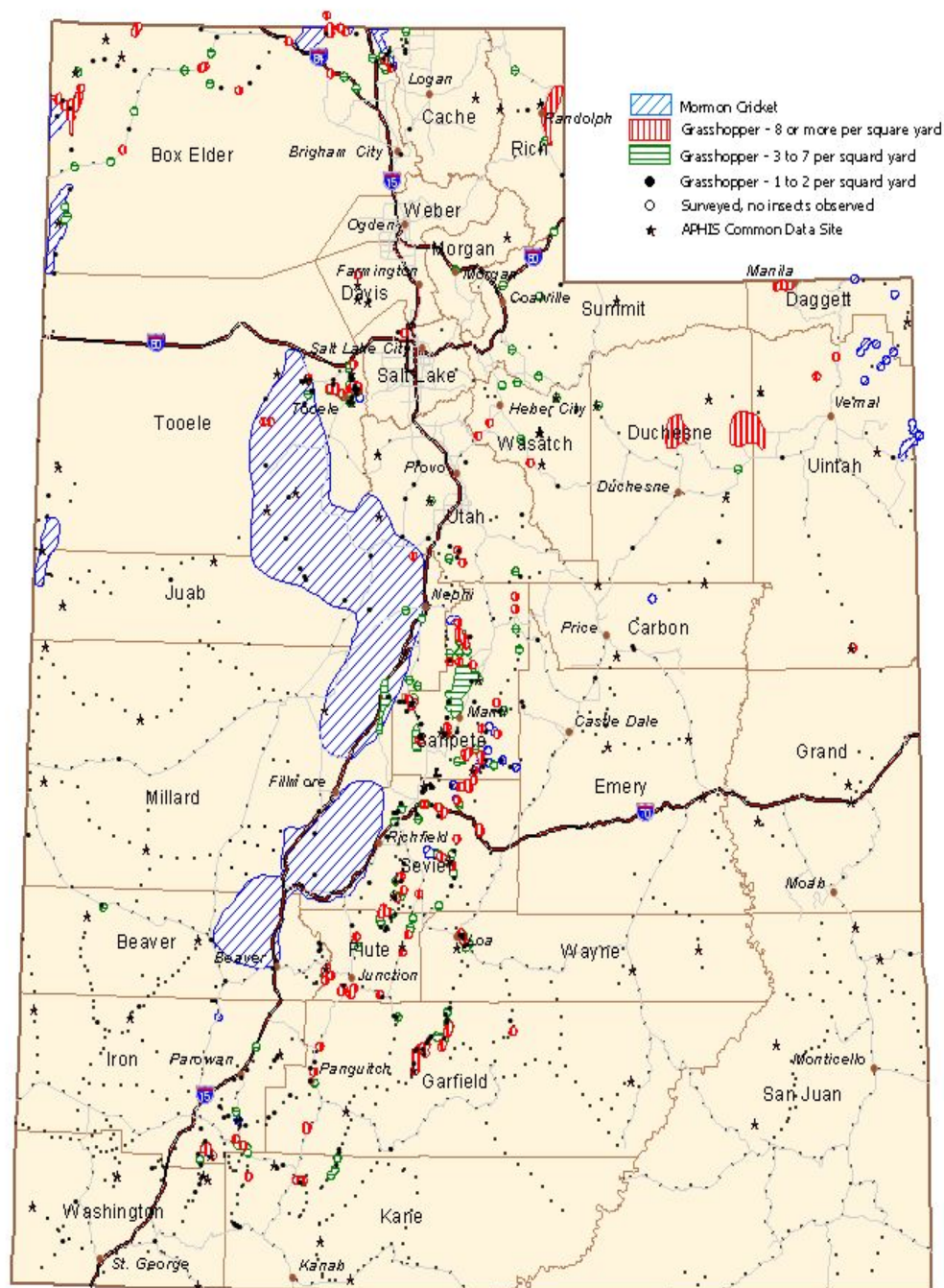
Six Year Grasshopper Infested Acreage Summary

	<u>1998</u>	<u>1999</u>	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>
Beaver	50,000	50,000	11,000	13,800	4,000	7,000
Box Elder	100,000	100,000	55,000	120,400	120,000	94,710
Cache			19,000	64,500	17,000	2,200
Carbon	5,000	1,000	12,300	56,100	21,600	
Daggett	1,000		600	4,900		8,530
Davis	10,000	10,000				2,530
Duchesne	5,000	5,000	1,300	82,400	8,700	70,800
Emery		2,500	3,500	10,400	6,400	
Garfield			6,800	10,900	4,200	52,560
Iron	10,000	10,000	7,000	5,000	12,300	24,540
Juab	15,000	20,000	33,000	174,000	46,300	21,030
Kane	15,000	15,000	10,300	1,300		16,710
Millard	40,000	50,000	52,500	216,800	8,950	6,500
Morgan	2,000	2,000	19,000	63,100		2,530
Piute			21,000	18,200	32,600	40,310
Rich				12,400		32,140
Salt Lake						2,530
San Juan			23,000	3,900	2,500	
Sanpete	25,000	150,000	157,000	183,500	268,400	142,680
Sevier	5,000	5,000	58,000	31,000	70,500	78,000
Summit			10,000	3,600	2,550	12,630
Tooele	30,000	55,000	5,700	74,600	161,800	39,000
Uintah	5,000	5,000	36,000	71,200	53,500	25,750
Utah	3,000	5,000	29,000	56,400	8,500	15,150
Wasatch			3,000	65,600	7,000	17,540
Washington	1,000	5,000		44,100	7,100	150
Wayne			2,000	2,000		10,430
Weber			17,000			
Total	322,000	490,500	593,000	1,390,100	863,900	725,950

USDA APHIS PPQ**UDAF Plant Industry***Six Year Mormon Cricket Infested Acreage Summary*

<i>County</i>	<u>1998</u>	<u>1999</u>	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>
Beaver			6,000	7,000	158,500	226,700
Box Elder					108,300	125,900
Cache				8,100	4,400	8,400
Carbon				33,100	33,100	2,530
Duchesne				83,900	7,000	
Daggett						4,600
Emery				1,150	1,100	50
Garfield						2,530
Iron						7,600
Juab	5,000	268,000	116,000	502,500	618,900	651,500
Millard	3,000	50,000	190,000	539,500	536,500	517,800
San Juan	1,000	1,000		18,300	14,400	
Sanpete		3,000				31,760
Sevier	800	1,000		24,500	85,500	190,200
Tooele	490,000	430,000	346,000	622,000	749,700	793,500
Uintah				48,800	48,900	31,300
Utah	10,000	5,000	500	5,650	74,600	116,200
Total	509,800	758,000	658,500	1,894,500	2,450,650	2,710,670

State of Utah 2003 Grasshopper Mormon Cricket Survey



GYPSY MOTH

Introduction


- Gypsy moths (*Lymantria dispar* L.) were accidentally released near Boston, Massachusetts in 1868. In 1890 the first attempts to eradicate the gypsy moth began, with eradication and suppression activities continuing to this day.
- The larval stage of the gypsy moth devours the leaves of more than five hundred species of forest and ornamental trees. Defoliation by gypsy moths can kill trees, affect a watershed's water quality through increased erosion, harm wildlife, and depress recreational activities. Hoards of migrating caterpillars are a major public nuisance in eastern states.
- Since 1984, many eastern states have spent an average of 2 million annually to control and suppress gypsy moth populations.
- Utah can save up to 30 million over the next twenty years by avoiding a serious gypsy moth infestation in the state.



Utah's Gypsy Moth Program

- Gypsy moths were first detected in 1988 in the Mt. Olympus Cove area of Salt Lake City. Smaller infestations were also located in Davis and Utah Counties.
- A combined state and federal survey and detection program has increased the number of gypsy moth traps from 516 in 1989 to 3,534 in 2003 to provide a better trapping network. However, moth catches have decreased from 2,274 in 1989, to 7 in 1999, 3 in 2000, 1 in 2002, and 2 in 2003. This is evidence of the success of the program.
- Utah's arid climate, mountainous terrain, and lack of effective natural predators of gypsy moths gives the state a high potential for gypsy moth infestation and subsequent mass deforestation. Since Utah is not part of the contiguous range of gypsy moths in the Eastern U.S., a program of prevention and eradication of the insect is more cost effective and beneficial to the state in the long term.

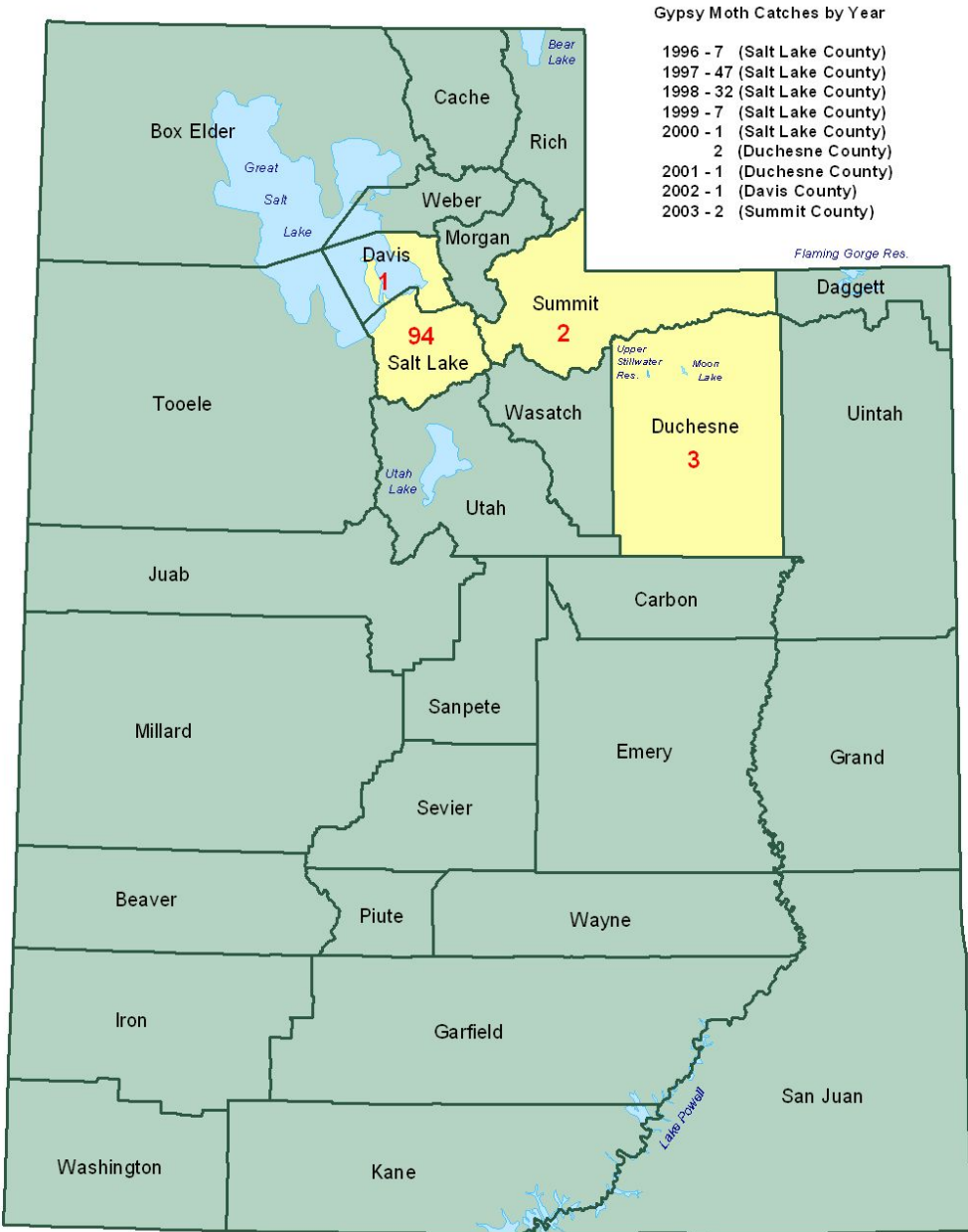
Utah Gypsy Moth Eradication History

- Eradication measures thus far have focused upon using the biological insecticide *Bacillus thuringiensis* (B.t.). B.t. is a naturally occurring soil bacterium that causes the gypsy moth larvae to become sick and eventually die. The insecticide has been used successfully in Utah since 1989, treating over 70,000 acres.
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- In May 1999, 764 acres in one location of Salt Lake County were sprayed with B.t. The spray program was initiated after 32 gypsy moths were detected in seven locations in 1998.
 - The cooperative gypsy moth eradication program includes: the Utah Department of Agriculture and Food, Division of Plant Industry, the USDA Forest service, USDA- Animal Plant Health Inspection Service (APHIS), the Utah Department of Natural Resources' Division of Forestry, Fire and State Lands, Utah State University Extension Service, The Salt Lake City/ County Health Department, as well as other agencies and local community councils.
 - A quarantine was established in Salt Lake County. A quarantine prevents new infestations by detecting new move-ins and preventing movement from infested areas.

Action Plan for 2004

- With Utah's arid climate and potential to mass deforestation by gypsy moth larvae, the only solution is early detection and eradication of the insect. In 2003, the cooperative Gypsy Moth Eradication Program plans to continue its detection- trapping network.

State of Utah
Gypsy Moth Catches 1996 - 2003



JAPANESE BEETLE

Introduction

- The Japanese beetle (*Popillia japonica*) was first discovered in the U.S. around 1916 in New Jersey.
- Japanese beetles feed on hundreds of different kinds of plants, but severe damage occurs on plants and trees grown as ornamentals. In addition to feeding on tree leaves, feeding larvae can damage commercially grown sod and urban lawns.
- The Japanese beetle can spread naturally and artificially over long distances by hitch hiking on infested plant material shipments.
- Utah's nursery and floriculture industry had sales of 29.5 million in 2003.



Utah's Japanese Beetle Program

- To help prevent the Japanese beetle from invading Utah by either natural or artificial means, the Utah Department of agriculture and Food has imposed a quarantine against this devastating insect (R68-15), effective January 4, 1993.
- The quarantine was strictly enforced in the spring of 2000 when UDAF learned of shipments of nursery products from Oklahoma suspected of carrying Japanese beetle larva. The department is currently working with the nursery industry, both in Utah and other states, to stop further unauthorized shipments.
- UDAF has also initiated a survey and detection program, using traps to determine the presence of Japanese beetles. UDAF placed over 600 traps in 2003, with no catches. Nurseries also placed traps, with no detection's.

Action Plan for 2004

- The Japanese beetle is a serious threat to Utah's agricultural and nursery industries. In 2004 UDAF plans to continue its detection-trapping program, and continue to enforce the quarantine to prevent a Japanese beetle infestation in Utah.

PLUM CURCULIO

Introduction

- The plum curculio (*Conotrachelus nenuphar*) is a dark brown and black weevil about $\frac{1}{4}$ inch long with projections on the wing covers.
- In the larval stage of its growth, the plum curculio will feed inside of fruit for approximately 14 to 17 days, causing fruit to decay, and destroying the crop.



Utah's Plum Curculio Program

- The plum curculio was first discovered in 1983 in Box Elder County, and has at times infested the fruit producing areas of Box Elder County.
- Plum curculio is a quarantined pest. The quarantine has in the past prevented Box Elder county fruit growers from shipping fruit to other states.
- The Utah Department of Agriculture and Food conducts an annual survey of plum curculio to determine the range and population density of this insect. Surveys have been conducted since 1990.
- UDAF coordinates a control program with cooperation from USU Extension. Spray programs are conducted with property owners to control with the intent of eradicating the insect. Orchard clean-up and tree-removal programs help to eliminate insect habitat.
- In 2002 UDAF and USU Extension mailed several thousand brochures to residents of Box Elder County explaining the importance of identifying and controlling plum curculio.

Action Plan for 2004

- The result of a plum curculio infestation in Utah could include a substantial reduction in crop yields, loss of markets, domestic and foreign quarantines on tree fruits, increased pesticide use, and increased production costs. UDAF and other agencies will continue to support investigation in 2004 into the biology of the insect and its lifecycle in Utah fruit crops and other host plants. Specific control or eradication recommendations will be the main emphasis of an updated education and outreach program in 2004.

RED IMPORTED FIRE ANT

Introduction

- The red imported fire ant (RIFA) is both a public health and an economic threat. They are a federally quarantined pest and are not known to occur in Utah.
- They were introduced into the U.S. from South America in the 1940's. Their current geographic distribution includes all of the Southern United States and the states of Arizona, Nevada, and California.
- Red imported fire ants cause livestock damage, allergic reactions, agricultural and ornamental plant damage, and increased use of pesticides. Economic damage associated with red imported fire ant in the United States exceeds 5 billion dollars.



Utah's Red Imported Fire Ant Program

- The Utah Department of Agriculture and Food is approaching the red imported fire ant concern with survey and detection trapping, quarantine enforcements, port of entry inspection and public education.

Action Plan for 2004

- Red imported fire ants are a serious threat to Utah's economy. In 2004 UDAF plans to continue its cooperative program of public education, quarantine enforcement and detection trapping. Additional state and federal funds may be needed to support this program.



Works Cited Reference

Cover page photo - USDA

Title Page photo - F. Gassen

African Honey Bee Photo - S. Bauer, USDA ARS

Cereal Leaf beetle Photo - L.K. Edkins

European Corn Borer Photo - USDA

Mormon cricket – D.T. Gwynne

Gypsy Moth Photo - USDA APHIS

Gypsy Moth Treatment Photo - USDA APHIS

Japanese Beetle Photo – J. A. Payne, USDA ARS

Plum Curculio Photo - J. A. Payne, USDA ARS

Red Imported Fire Ant Damage Photo - USDA